

# Garden Creek TMDL Development

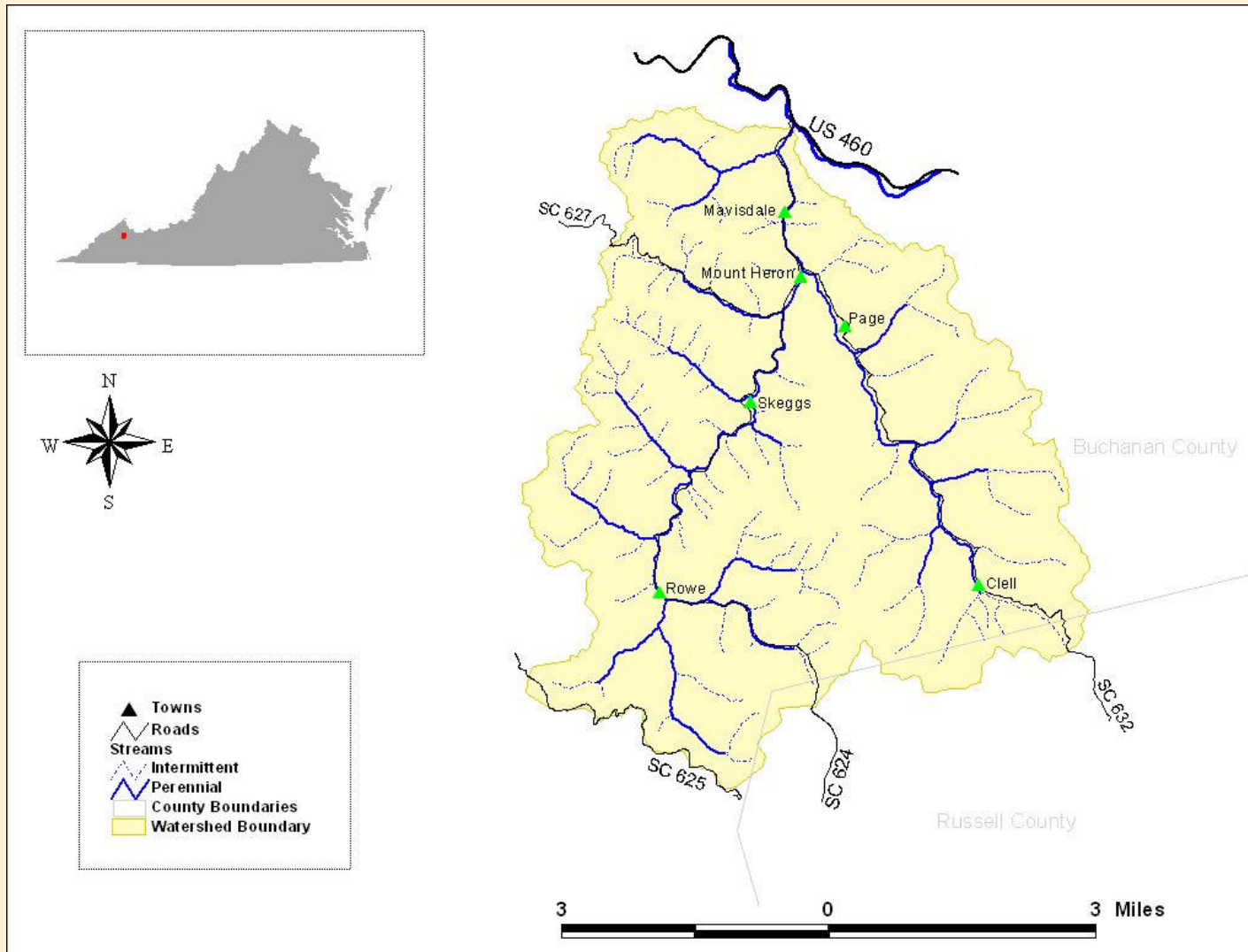
First Public Meeting  
November 9, 2006

2006





# Where is the Watershed?







# Why Are We Here?

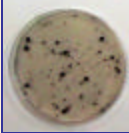
- To discuss TMDLs for Garden Creek
  - Total Maximum Daily Load
  - It is how much pollutant can enter the stream and have the stream meet the water quality standards





# Why Are We Here?

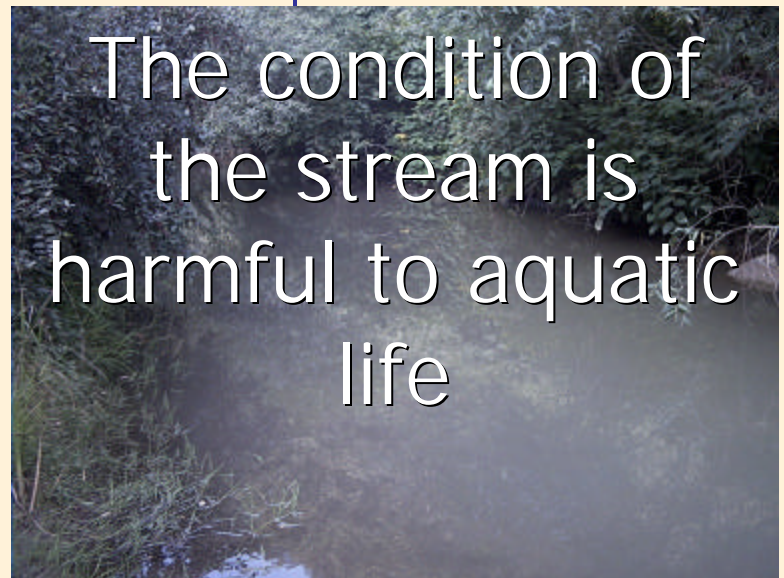
## Two Problems!



### #1 Bacteria

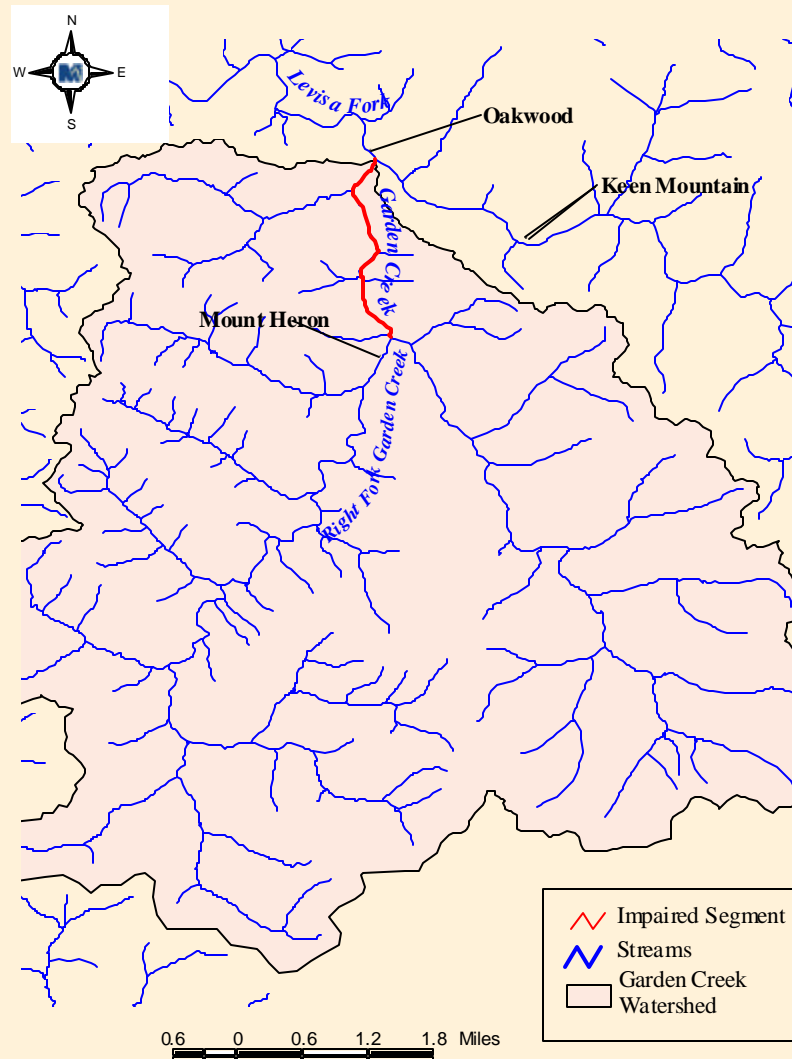


### #2 Aquatic Life



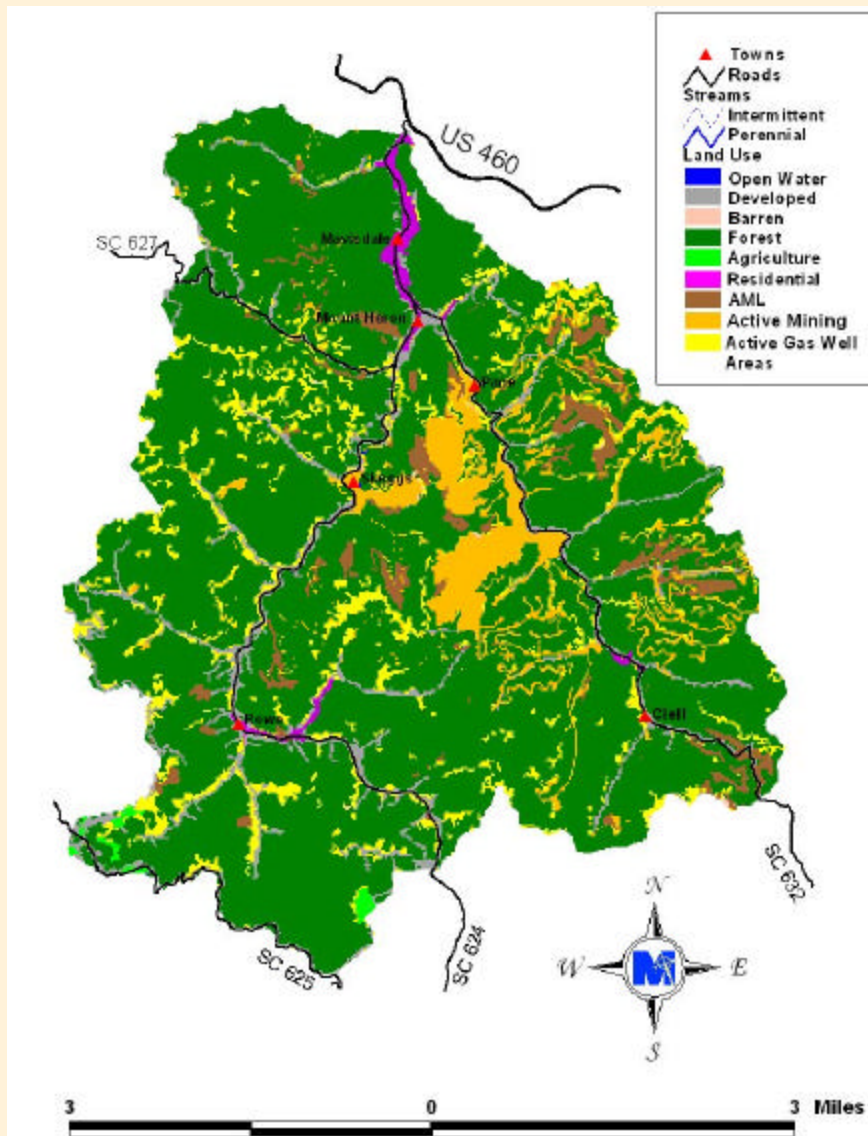


# Where is the Impairment?



# Garden Creek Watershed

## Land use



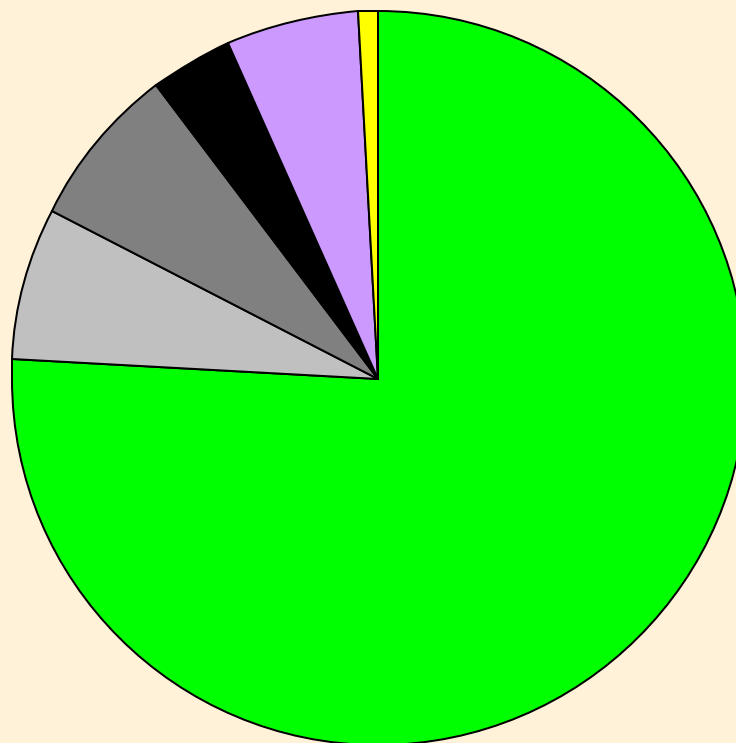




# Garden Creek Watershed

## Land Use Percentage

---



- **Forest - 76%**
- **Active Gas Wells - 7%**
- **Active Mining - 7%**
- **Abandoned Mine Land - 4%**
- **Developed - 6%**
- **Residential - 1%**



# Fecal Bacteria Impairment

VADEQ station	Count (#)	Minimum (cfu/100ml)	Maximum (cfu/100ml)	Violations <sup>1</sup> %
6AGAR000.16	50	0	8,000	62

<sup>1</sup> Violations are based on the current fecal coliform instantaneous standard 400cfu/100ml)

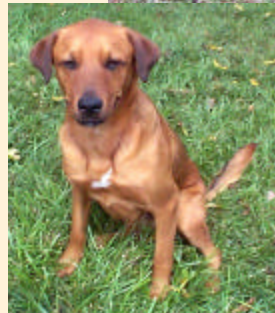
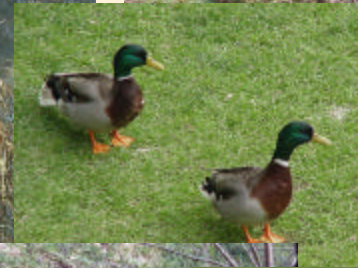




#1

# What are the Sources of Bacteria?

- Permitted discharges
  - Wastewater treatment facilities
- Human
  - Straight Pipes
- Pets
- Livestock
- Wildlife

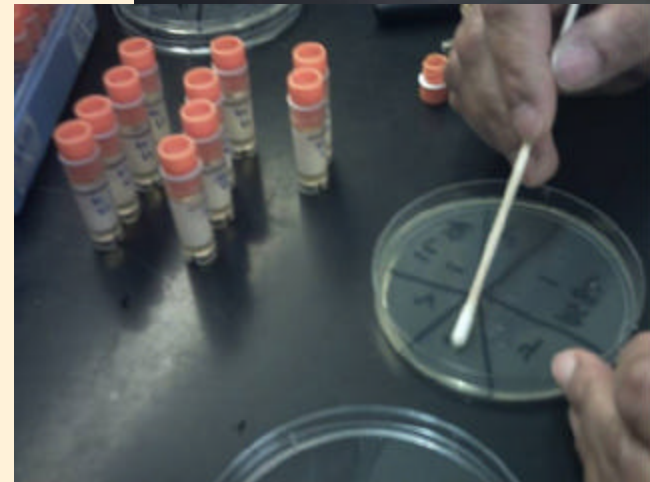
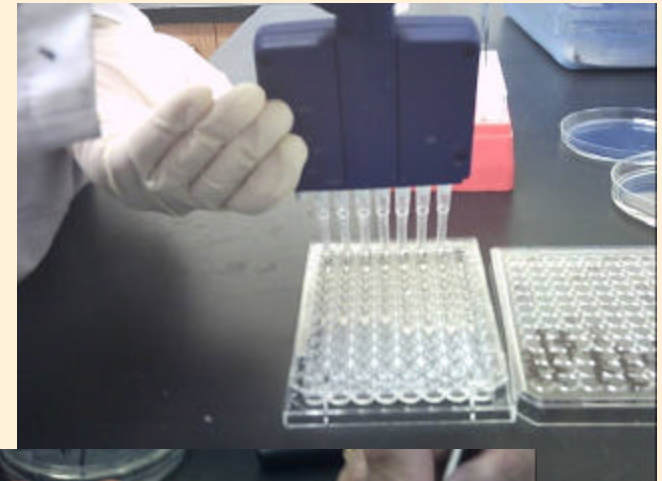


#1

# Bacterial Source Tracking (BST)

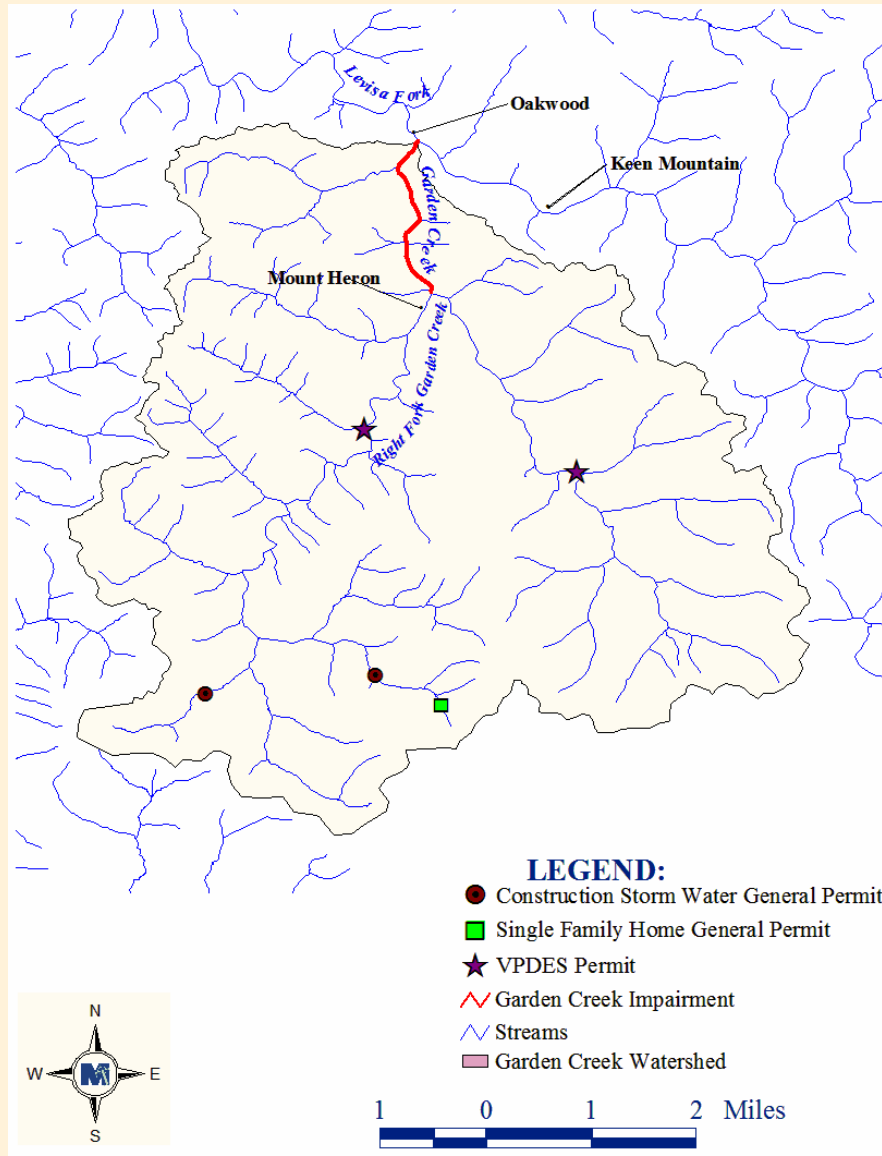
## Independent Lab Test

- Determines bacteria source
  - human
  - pet
  - livestock
  - wildlife



#1

# Garden Creek VPDES Permits







# Garden Creek VPDES Permits

Receiving Stream	Permit ID	Facility
Garden Creek Right Fork	VA0066010	Island Creek Coal Company
Garden Creek	VA0066907	Consolidation Coal Company
Garden Creek Right Fork	VAG400342	Knox Creek Coal Corp - Tiller No 1 Mine Bathhouse
Garden Creek Right Fork	VAR100052	VDOT Lebanon - 0624 013
Long Branch	VAR101850	VDOT Lebanon - 0660 013





#1

# Human Source

---

- U.S. Census
  - Population
  - Housing Units (HU)
  - On-site Sewage Treatment Systems
- Sanitary Sewer
  - Loading rates
    - ◆ Age, size, material of pipes
    - ◆ Overflows
  - Land-applied / direct deposition
    - ◆ Loading type
    - ◆ Proximity to stream



#1

# Human Source

- Septic Systems
  - Failure percolate through soil, during wet weather stays on top of the ground.
  - Lateral movement continuously to stream
- Straight Pipes
  - Direct continuous input into stream
- Biosolids
  - Land-applied





#1

# Human Population

Population	Housing Units	Housing units with sewer	Housing units with septic	Housing units with other
1,315	721	132	537	40

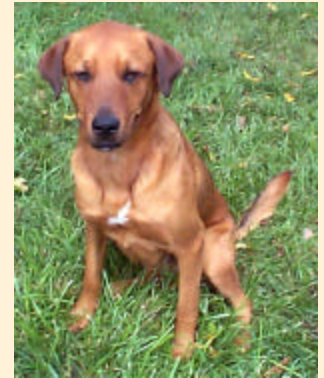




# Pet Sources

- Population/household based on literature values
- Translated to HU based on U.S. Census
- Land-applied

<b>D o g s</b>	<b>C a t s</b>
3 8 5	4 3 1





# Livestock Sources

---

- Population
  - Virginia Ag. Statistics
  - Consultation with Big Sandy SWCD, VADCR, NRCS
  - Watershed visits
- Distribution of waste
  - Pastured
  - Confined and waste collected
  - Direct deposition to the stream
- Seasonal varying applications





# Livestock Population

---

**Beef**

0

**Swine**

0

**Dairy**

0

**Horse**

3

**Goat**

5

**Roosters**

87

#1

# Wildlife Sources

- Population based on data provided by VDGIF biologists
- Distribution of waste based on habitat
  - Land-applied
  - Direct deposition to the stream
- Seasonal variations based on migration patterns and food sources



Deer	Turkey	Raccoon	Muskrat	Duck	Goose
------	--------	---------	---------	------	-------

67

139

1,356

6,395

4

0



# Why Are We Here Again?

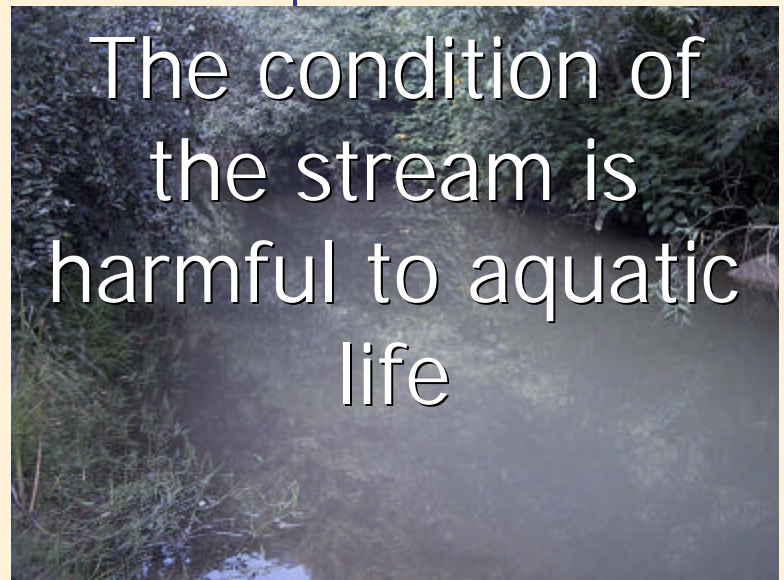
## Two Problems!



### #1 Bacteria



### #2 Aquatic Life



#2

# Benthic Assessment

- The modified Rapid Bioassessment Protocol II

## Historic Monitoring Results

Station	Date	Benthic Assessment
6AGAR000.16	4/11/1996	Severely Impaired
6AGAR000.16	11/12/1997	Moderately Impaired
6AGAR000.16	11/18/1998	Moderately Impaired
6AGAR000.16	6/23/1999	Moderately Impaired
6AGAR000.16	9/15/1999	Moderately Impaired
6AGAR000.16	6/8/2000	Moderately Impaired
6AGAR000.16	4/26/2005	Moderately Impaired
6AGAR000.16	5/15/2006	Severely Impaired

## Additional Upstream Monitoring Results 2006

Stream	Station	Date	Benthic Assessment
Right Fork Garden Creek	6AGRF000.56	5/15/2006	Severely Impaired
Right Fork Garden Creek	6AGRF004.97	5/15/2006	Moderately Impaired
Garden Creek	6AGAR002.00	5/15/2006	Moderately Impaired
Garden Creek	6AGAR005.25	5/15/2006	Moderately Impaired



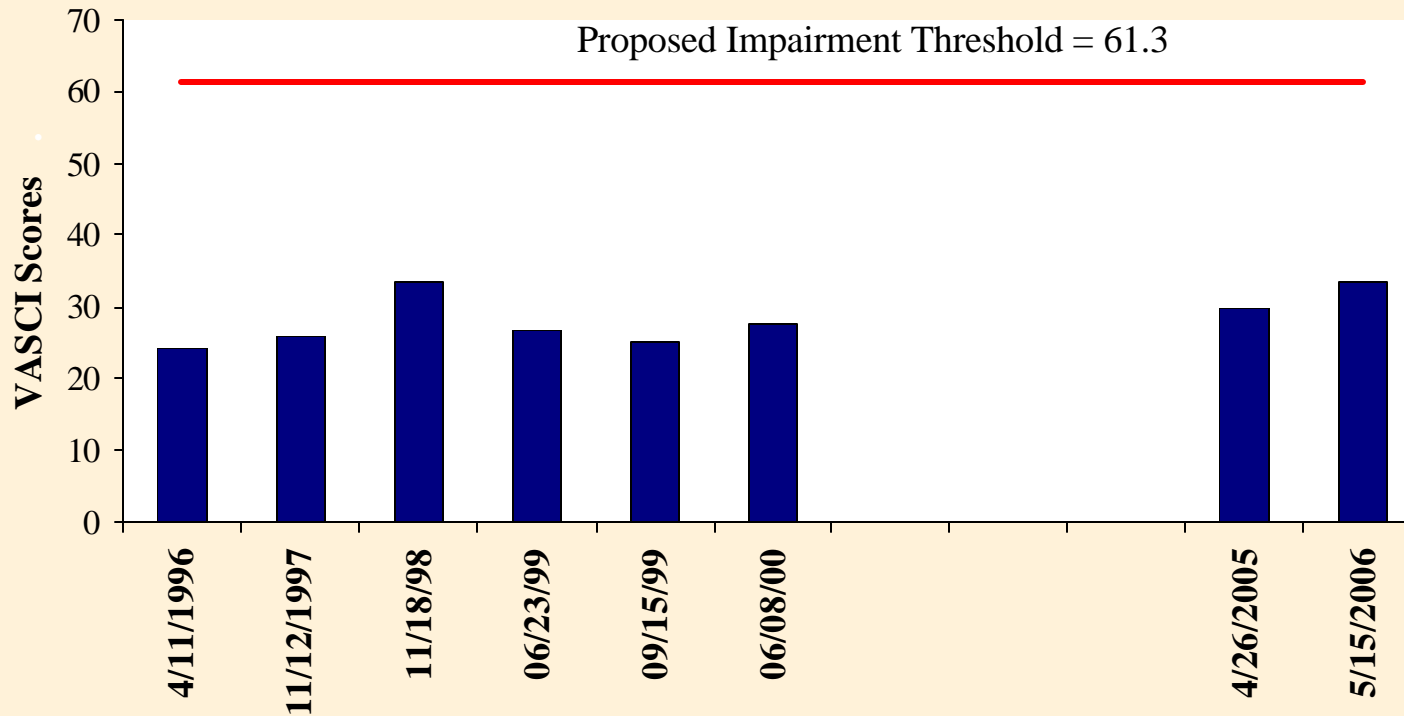




#2

# Benthic Assessment

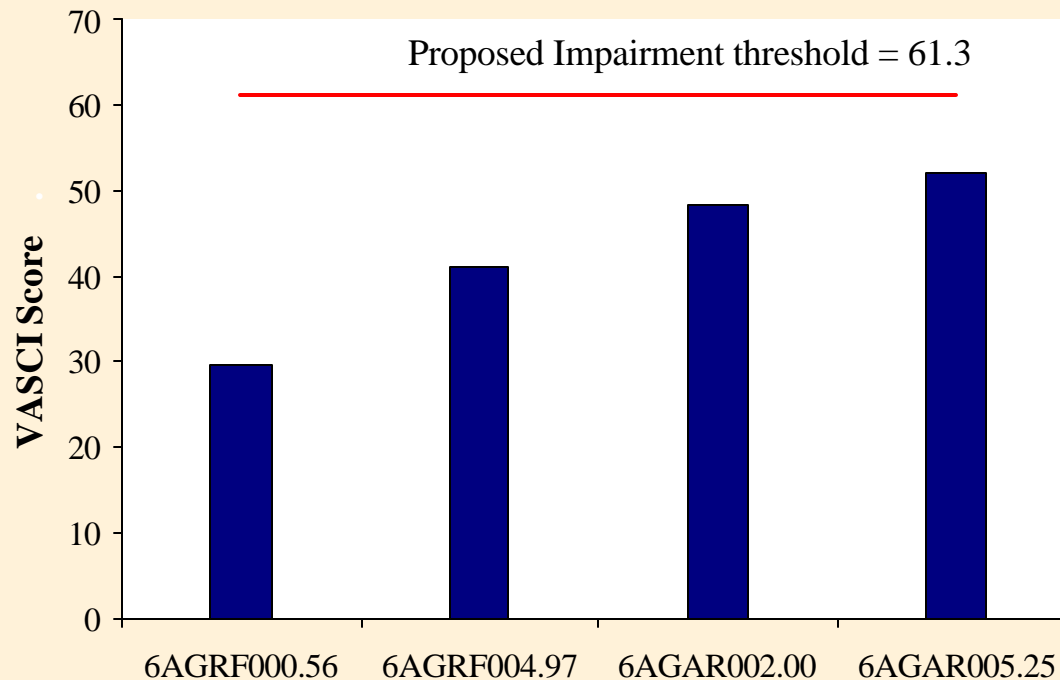
- The Virginia Stream Condition Index
  - Proposed Impairment threshold of 61.3



#2

# Benthic Assessment

- The Virginia Stream Condition Index
  - Proposed Impairment threshold of 61.3
  - Upstream monitoring stations 5/15/2006





#2

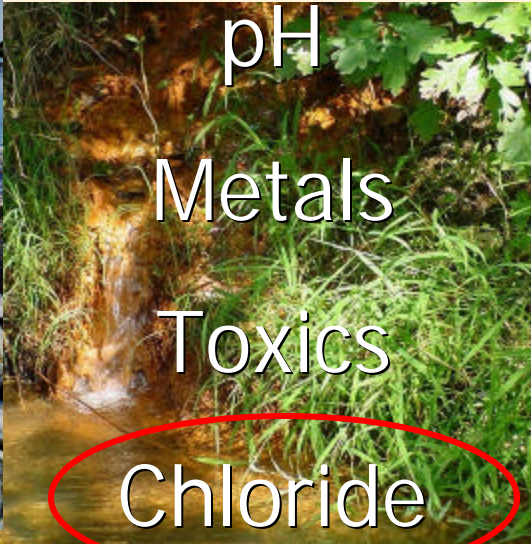
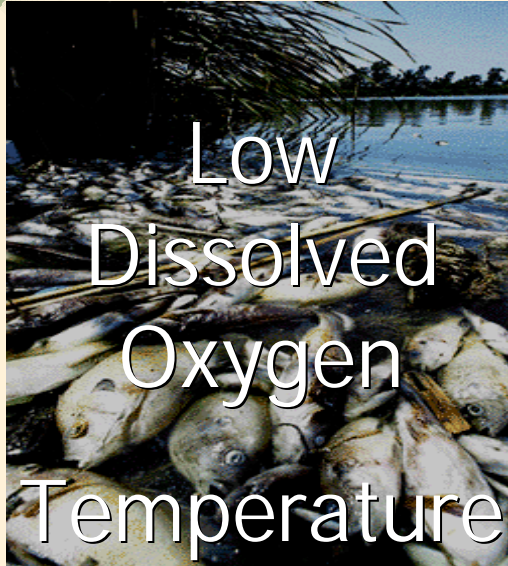
# Stressor Analysis

---

- Identify potential stressors
  - Streamwalks
  - Water, sediment & fish tissue pollutant analysis
  - Toxicity studies
  - Comparison with candidate reference watersheds
- Analyze data for each potential stressor
- Determine most probable stressor(s) for basis of TMDL

#2

# What is harming the Aquatic Life?





#1

# How do we Determine the TMDL?



+

Watershed data



TMDL

#2

# How do we Determine the TMDL?

TDS and  
Chloride  
Sources

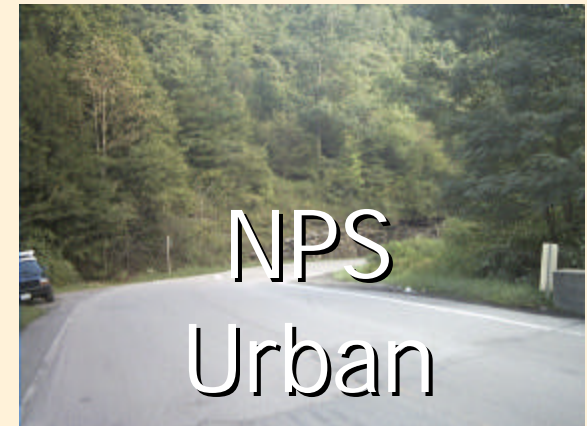
Watershed data



TMDL

#1

# What *E. coli* reductions are required?





#2


# What TDS & Chloride reductions are required?



Direct  
Human



NPS  
Runoff



NPS  
AML



Mine PS  
Discharges



# What's next?

- Public Meeting 2 (Date?)
- Public Review
- Submit to EPA
- State Approval
- Implementation Plan Development
- Implementation





# Garden Creek TMDL Contacts

---

- Department of Environmental Quality
  - Alan Newman, TMDL Project Coordinator
    - ◆ 276-676-4804
- Department of Mines, Minerals, and Energy; Division of Mine Land Reclamation
  - Joey O'Quinn, TMDL Project Coordinator
    - ◆ 276-523-8151
- Department of Conservation and Recreation
  - Theresa Carter, TMDL/Watershed Field Coordinator
    - ◆ 276-676-5418
- MapTech, Inc.
  - Rod Bodkin
    - ◆ 540-879-9294
- Civil & Environmental Consultants, Inc.
  - Dr. Jim Mudge
    - ◆ 800-365-2324

